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Vol. 71 No. 17 Issue No. 4229 335-356

April 25th, 1959

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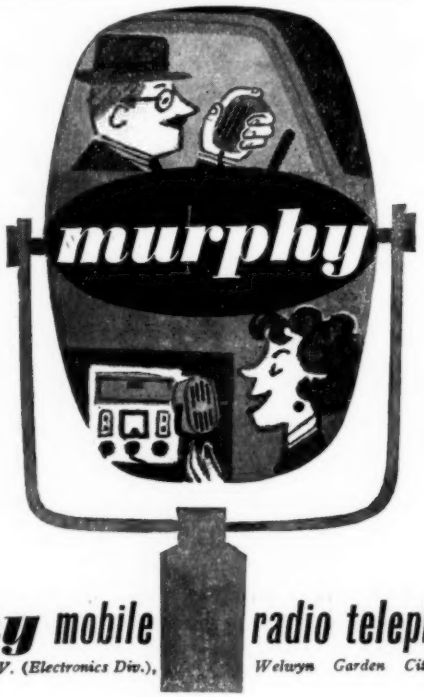

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7, MANSFIELD STREET, PORTLAND PLACE, LONDON, W.1. MUSEUM 6541

No. 17 APRIL 25th, 1959 Vol. 71

Registered for Transmission as a Newspaper *Price 2s. post free*

Corticosteroids in Veterinary Medicine

BY

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Introduction

THE increased knowledge of adrenocortical function and the discovery of cortisone and related steroids may well rank among the greatest medical developments of this century. There is already extensive medical literature on these substances, but for information about veterinary applications we have to rely mostly on work carried out in the United States, where the uses of these drugs have been widely reported.

The clinical value of cortisone and related substances can only be fully realised when the underlying theory of their actions and uses is understood and evaluated under our own conditions of practice. An attempt will be made here to review briefly

(a) pharmacological properties of corticosteroids,

(b) some of the conditions for which these substances have already been used,

(c) some known contra-indications to these substances.

Production of Corticosteroids

Cortisone came into prominence in 1949, when Hench *et al.* demonstrated its striking therapeutic effect in human rheumatoid arthritis. Only minute quantities of cortisone could be obtained from the animal adrenal cortex. Within a relatively short time several laboratories succeeded in synthesising it by a number of different routes from natural steroids. Among these hecogenin, from the waste material of sisal manufacture, proved suitable. Sisal is obtained in East Africa and is refined in Great Britain; the synthesis of cortisone from hecogenin involves more than 20 stages.

Pharmacological Properties

Adrenal Steroids

Secretion of the adrenal cortex is controlled by the adrenocorticotrophic hormone (ACTH) produced in the anterior lobe of the pituitary gland. About 30 steroids have been isolated from cortical material; some of these have no clear physiological activity and may indeed be artefacts of isolation.

The two important corticosteroids found at relatively high levels in all adrenal glands of mammalian species so far investigated are hydrocortisone and corticosterone (Hechter & Pincus, 1954). The ratio of the two steroids even in a particular species varies considerably. Other corticosteroids are secreted in "trace" amounts, again varying somewhat with species. It is emphasised, however, that "such trace components are not necessarily of minor physiological importance," Hechter & Pincus (1954).

Bush (1953) and Hechter & Pincus (1954) reported that the adrenals of man, monkeys and sheep secrete principally hydrocortisone, those of rats and rabbits chiefly corticosterone, and that cats, dogs, ferrets and cows secrete a mixture of both types. Pincus (1958) reported that 7 compounds are identified in the adrenal vein blood of various species and can be regarded as normally occurring adrenocortical products. These include 5 characteristic corticosteroids (cortisol, corticosterone, aldosterone, 11-deoxycortisol, and 11-desoxycorticosterone) and 2 androgens (Δ^4-androstenedione and 11-β-OH-Δ^4-androstenedione).

Adrenocortical hormones have a profound influence on several metabolic processes and tissues. It is usual to divide the biologically active steroids into 3 main groups:

(i) *Glucocorticoids*, so named because of their readily observed effect on carbohydrate metabolism. These include corticosterone, cortisone and hydrocortisone, are concerned with the general metabolism of carbohydrates, proteins and fat

and have also anti-inflammatory (antiphlogistic) and anti-allergic tissue effects.

(ii) *Mineral corticoids*—such as desoxycorticosterone and aldosterone. These steroids have a pronounced influence on the metabolism of sodium, potassium and water, being concerned with regulation (maintenance) of electrolyte and water balance.

(iii) *Sex steroids*, including a somewhat heterogeneous collection of oestrogens, androgens and progesterones; as far as is known they are of no clinical importance.

The sub-division into so-called glucocorticoids and mineral corticoids is not rigid, as the steroids of either group can influence both carbohydrate and electrolyte metabolism; for example, cortisone is as much a mineral corticoid as a glucocorticoid, since it affects both glycogenesis and ionic balance.

The administation of corticosteroids can influence the metabolism of

(1) *Carbohydrate*—glycogenesis from protein or fat occurs.

(2) *Protein*—a rise in protein breakdown, which can result in negative nitrogen balance and increased urinary excretion of nitrogen.

(3) *Fat*—acceleration of breakdown and mobilisation of fat. Prolonged use in man may cause deposition of fat in the subcutaneous tissue of the face. In a few dogs some weight increase has been noticed when prednisolone has been given for up to one month.

(4) *Electrolyte and water balance*—sodium and chloride retention may occur, accompanied by increased potassium excretion, which may result from protein breakdown and possibly by direct action on the renal tubules. An effect on the gastro-intestinal tract, resulting in an increased secretion of hydrochloric acid and pepsin, has also been reported by Cecil & Loeb (1955).

Effect on Mesenchymal Tissues

This includes connective and lymphoid tissues, blood vessels and synovial membranes. Cortisone and allied drugs suppress the activity of all these tissues: their administration has various consequent results.

(a) *Blood formation*—A decrease in circulating lymphocytes and eosinophils and in phagocytic activity of reticulo-endothelial system, with a resultant depression of all the elements of the inflammatory process.

(b) *Capillary resistance*—A decrease in permeability of serous membranes and vessels and an increase in capillary resistance.

(c) *Tissue regeneration*—in connective tissue. Some inhibition of granulation tissue may occur experimentally, but this appears to depend on the dose used. It has not been reported in animals. There may be delay in callus formation. Depression of activity of the lymphoid tissue may also occur.

(d) Depression of allergic and hypersensitivity effects.

(e) Variable effect on clotting mechanism.

(f) Depression of globulin formation and antibody production.

Corticosteroids are also important in many normal physiological processes, since they play a broad part in the maintenance of life, the ability to work, resist stress and maintain normal carbohydrate levels, the initiation and maintenance of lactation and so on.

It has also been shown that the adrenal cortex secretes an increased amount of hormones after any apparently unrelated stimulus, such as heat, starvation, fatigue and infection. Sayers (1950) stated that "the various functions of the cortical hormone are the varied expressions of the ubiquitous single action, albeit complex, concerned with the mobilisation of energy for cellular work, regardless of the type of cell involved or the nature of the work performed." It is also known that in response to many stimuli the body's need for adrenocortical hormones is increased. Those stimuli that are dangerous in causing a "harmful state of disturbed homoestasis within the body" (Ingle & Baker, 1953b), trauma, burns, heat, cold, infection, even administration of drugs and anaesthetics, have been called "stressor factors," and the whole phenomenon is known as "stress." Moreover the activity of the adrenal cortex is increased during every type of stress so far investigated. (Chester Jones, 1957).

It is well to remember here the "stress" theory postulated by Selye (1946) in which the adrenal gland is so much involved, particularly as reference to stress is made in this review.

Selye found that in experimental animals exposed to certain conditions such as cold, starvation, increased exercise, or if injected with diverse substances, certain changes were produced in some organs irrespective of nature of exposure or the agent used. These changes included involution of lymphatic structure, adrenal enlargement and gastro-intestinal ulcers. This non-specific systemic reaction of the body he called "the general adaptation syndrome." He defined it as "the sum of all non-specific systemic reactions of the body, which ensue upon long continued exposure to stress."

Moreover, it was found that animals exposed to certain types of stress showed 3 distinct phases in the general adaptation syndrome. They are:—

1. *Alarm reaction*—is "the sum of all non-specific systemic phenomena elicited by sudden exposure to stimuli, to which the organism is quantitatively and qualitatively not adapted." In this phase the various stimuli can produce a degree of "shock," and there is active corticoid secretion and adrenal enlargement as a manifestation of active defence against this "shock."

2. *Stage of resistance* "represents the sum of all non-specific systemic reactions elicited by prolonged exposure to stimuli, to which the organism has acquired adaptation as a result of continuous exposure." This stage is characterised by an increased resistance to the particular agent to

which it has been exposed, but is usually accompanied by a decrease in resistance to other types of stress.

3. *Stage of exhaustion* " represents the sum of all non-specific systemic reactions which ultimately develop as a result of very prolonged exposure to stimuli, to which adaptation has been developed but could no longer be maintained."

It is possible that the first or second stages may occur without any apparent clinical signs of disease or dysfunction. In extreme conditions when the stage of exhaustion is reached, an upset in general metabolism may occur and result in clinical symptoms. Such conditions are regarded as " by-products of abnormal adaptive reactions to stress," and are known as " stress diseases " or " diseases of adaptation." In these the adrenal cortex secretes either an excess or an imbalance of its hormones, which may play a part in several diseases (Chester Jones, 1957). This hypothesis is of great interest to many workers. If accepted, it means that it is now possible to differentiate between specific causes of disease, such as bacteria and viruses, and non-specific causes, in which the general adaptation syndrome plays an important part. In veterinary medicine acetonaemia has been cited as " disease of adaptation."

In addition to these effects on the body, corticosteroids have others, less tangible and requiring further elucidation.

Corticosteroids in Clinical Use

The hormone active in tissues is cortisol or, as it is more widely known, hydrocortisone. Cortisone itself is said to be active after conversion into hydrocortisone. Cortisone was the first substance to be used clinically, then came hydrocortisone; many variations of their formulae have been tried, in order either to improve upon them or to diminish their possible side effects. These included a group of substances known as " halogenated compounds " (produced by substitution of halogen atom in the 9 α-position). Borman & Singer (1954) and Liddle *et al.* (1954) found some of these to be 3 to 4 times more potent than cortisone in glycogenic effect, in particular 9 α-chlorohydrocortisone acetate and 9 α-chlorocortisone acetate. Ward *et al.* (1954) found that 9 α-fluorohydrocortisone acetate had an anti-inflammatory effect about 10 times that of hydrocortisone, though this was followed by an increased effect on electrolyte metabolism.

More recently two other steroids have been evolved—the *Δ-derivatives, prednisone and prednisolone.* They differ chemically from the naturally occurring steroids and are about 4 times more active than the original compounds. Prednisone is the Δ-derivative of cortisone and prednisolone that of hydrocortisone. By local application prednisolone is about twice as potent as hydrocortisone. Therapeutically the dose of the Δ-derivatives is about one quarter that of the cortisone preparations. They are said to have less effect on electrolyte balance, but have in man the same side effects.

The synthesis of new steroids, which continues with great rapidity, has resulted in the availability of additional compounds with different characteristics. It is impossible to list them all, but the use of several recently reported (*Lancet* (1958) *ii*, No. 7045, 511) is being investigated in man; they include (1) *triamcinolone* (9-α-fluoro-16-α-hydroxyprednisolone), which possesses glucocorticoid activity without mineral corticoid effect on sodium and water retention. It is said to be more effective than prednisone or prednisolone in maintaining certain cases of asthma and atopic dermatitis in remission. (2) *medrol* (6-methyl-prednisolone), whose anti-inflammatory effect is said to be about 5½ times that of hydrocortisone and twice that of prednisolone.

Another steroid, similar to triamcinolone, (3) *dexamethasone,* (16-α-methyl-9-α-fluoro-prednisolone) is said to be 5 to 10 times as potent as prednisolone in controlling rheumatoid arthritis. In laboratory animals the anti-inflammatory effect was found to be 190 times that of hydrocortisone, but the glycogenic effect was only increased seventeenfold. This dissociation of anti-inflammatory and glycogenic activities, which are related in the steroids studied first, may have a bearing on the search for other steroids.

The side effects appear to be similar to those of the Δ-derivatives. The use of these substances has not been reported in the veterinary literature. They are mentioned here to indicate the type of investigation taking place in the chemical and medical spheres. Already a considerable number of preparations is available, and the clinician is in a position to choose the appropriate drug for treating a variety of conditions. More recently an intravenous preparation, hydrocortisone sodium succinate, has been introduced for use in emergencies, such as shock.

Many of the corticosteroids are relatively insoluble and have to be used in suspension. This has been remedied in prednisolone phosphate, which is water-soluble.

SUGGESTED DOSAGE

Animal	*Dose*	*Route*
CORTISONE		
Horses and cattle	1 to 2 gm. followed by 500 to 700 mg.	Intramuscular
Cats and dogs*...	5 to 75 mg.	Oral or intramuscular
HYDROCORTISONE		
Horses and cattle	250 mg. to 1·5 gm.	Intramuscular
	100 mg. to 250 mg.	Intra-articular
Dogs*	5 to 40 mg.	Oral
Dogs	25 to 50 mg.	Intra-articular
Cats	2·5 to 5 mg.	Oral
HYDROCORTISONE SODIUM SUCCINATE		
Horses and cattle	100 to 600 mg.	Intravenous or Intramuscular
Cats and dogs ...	10 to 50 mg.	Intravenous or Intramuscular
PREDNISOLONE		
Horses and cattle	100 to 200 mg.	Intramuscular
Cats and dogs*...	10 to 40 mg.	Intramuscular

* According to weight.

Dosage

There is no fixed dosage for these substances; a general recommendation is to use cortisone 1 mg. per lb. bodyweight, although sometimes as much

as 5 mg. per lb. has been used for small animals. In acetonaemia, the dose of cortisone used has been 1 to 1.5 gm., or of prednisolone 100 to 200 mg.

The initial doses given below, modified according to the clinical response, have been reported.

Initial Dose. The dose should be assessed by the clinician for each individual. It is best to begin treatment at the higher ranges of dose and to scale down the dose gradually as soon as a response is achieved. Sudden withdrawal of these drugs may in some cases result in relapse.

Clinical Application

In practice these hormones do not cure disease—they merely reverse symptoms or suppress lesions. In this way they can check the cycle of pathological changes and so possibly enhance treatment and reduce the duration of disease. In addition it is recognised that they can influence only the early reversible changes in tissue reaction. If irreversible changes are present their use may lead to disappointing results. These steroids are not bacteriostatic or bactericidal; if infection is present, or even suspected, the use of antimicrobial agents must be an essential part of treatment.

In general the clinical use of corticosteroids falls into 2 main groups :—

(i) Anti-inflammatory and anti-allergic uses. This is the largest use in veterinary practice.

(ii) Treatment of a variety of conditions for which they act as replacement therapy.

Routes of Administration

Since these steroids can exert potent effects on the body, it is necessary to be selective about their routes of administration. Whenever possible corticosteroids should be given locally rather than systemically, so as to limit depression of the defence mechanism of the body. The following uses can be recommended.

1. *External application* for the treatment of ears, eyes (superficial lesion), skins. Hydrocortisone or prednisolone with or without antibiotics is generally used.

2. *Intra or peri-articular* for joints, tendons, etc., particularly if a single accessible joint is involved—substances used, as in (1) above.

3. *Systemic* when skin lesions are extensive or severe ; when the deeper structure of the eye is involved ; for arthritic conditions involving several joints or structures not easy to inject ; in metabolic diseases in ruminants. The intramuscular route may be employed. Prednisolone suspension is chiefly used for injections ; tablets are available for oral use in small animals. For emergencies, intravenous corticoids are available.

4. *Sub-conjunctival* for use when the deeper structure of the eye is involved. Cortisone acetate suspension 25 mg. per ml.; in the dog using 0.1 to 0.3 ml. (Magrane, 1951). In cattle 50 mg. has been used (Scott, 1957). Hydrocortisone acetate 2.5% concentration doses of 0.3 to 0.5 ml. has also been used (Gordon, 1954).

External Application of Corticoids

The effect of these steroids in suppressing inflammation has led to their uses in a wide variety of conditions. The mechanism of this action is not fully known, but the effect is seen as a reduction in hyperaemia, swelling, cellular exudation and pain, that is as a disappearance of the physical signs of inflammatory processes. It is possible that changes in permeability of cell membrane may play a part. It has also been noted that after corticosteroid administration fibroblasts appear to show increased granularity and are apparently more resistant to lysis (Long & Favour, 1950). This anti-inflammatory effect is non-specific and appears to act whether the initial causal agent be allergic, chemical, bacterial or physical. It is because of this important action that corticosteroids have been used for the treatment of skin, eye and ear diseases.

The information summarised below comes from published reports (mainly of American origin), from clinical trials of practising veterinary surgeons in this country and from my own experience of the use of these drugs.

1. Skin Conditions

Various types of skin conditions, chiefly in small animals, are being treated with corticosteroids, with good results in most (Karmin, 1955). The action of hydrocortisone applied to the skin is said to be due to its direct local hormonal effect at cellular level. No sensitisation due to the hormone itself has been recorded.

Conditions treated include urticaria, non-specific and allergic dermatitis, alopoecia and some types of eczema, *i.e.* interdigital eczema, moist eczema and eczema secondary to parasitic infection. Pustular dermatitis may respond to combined treatment with corticosteroids and neomycin (Moon, 1954). *Acanthosis negricans* in dogs has also been successfully treated by the oral use of prednisolone for 2 to 3 weeks. Monk (1958) treated acute eczema in Spaniels, a Terrier and 2 Labradors. Other treatments, including those with ACTH and antihistamines, had previously been used with mixed results, sometimes with failure. In each case prednisolone orally for 4 to 6 days gave good results, which were safeguarded by gradual reduction of the amount used. No relapse had been encountered at the time of reporting the results. Dall (1958) stated that 80 to 90 per cent. of skin conditions treated in small animals can be improved by the use of corticosteroids. Miliary eczema in cats is also said to respond to oral use. Some cases undoubtedly relapse, particularly if treatment is stopped suddenly. The general impression is gained that non-parasitic dermatoses and eczema took 7 to 14 days to clear up with some of the drugs formerly used, whereas with the corticoids the response can often be achieved in 2 to 4 days.

Preparations in Use

These may include lotions and ointments in different bases and at different concentrations. In acute cases, application of these substances should

be repeated frequently, until relief is obtained, and then discontinued gradually. Systemic uses may be indicated for widespread lesions. Adjunct therapy of secondary infections or parasitic conditions is essential.

2. Eye Diseases

Corticosteroids are important in ancillary treatment of many eye conditions (Magrane, 1951; Bunce, 1955; Glenney, 1957; Gordon, 1955; Magrane, 1955; Jones, 1957; Moon, 1954; Henderson, 1956; Williams, 1956; Larsen, 1958; Scott, 1957). It has been shown (Gordon, 1955), that they suppress the exudation phase of inflammation. They produce a decreased vascularisation of granulation tissue and fibroblastic proliferation, which results in a reduction of pain and disability from eye disease. The effect is suppressive, not curative, and adjunct therapy must be applied to treat the cause. Larsen (1958) has stated that "this suppression is essential to the integrity of the eye." The effect of the suppression of inflammation may be for other drugs to penetrate better and, by inhibition of exudates, to allow healing to take place with reduced scar formation.

Diseases Treated

Treatment, mainly with good results, has been reported in

conjunctivitis	some types	periodic ophthalmia in horses
keratitis		infectious keratoconjunctivitis or "pink eye" in cattle
corneal ulcers		traumatic and surgical conditions
acute iritis		entropion—symptomatic relief
iridocyclitis		
panophthalmia		

Although corticosteroids should be used for treatment of early cases of the above conditions, some clinical reports indicate that they may be successfully used even in more advanced ones, such as in corneal ulcers with melanosis, or keratitis, particularly in pekes, in which reduction of melanin (Woodrow, 1958) has been reported. The disappearance of "milk spots" in some cases of keratitis has also been recorded (Henderson, 1956). In infective conditions, antimicrobial drugs must be used as well. Local application of corticosteroids has no pharmacological effect on tissue (Larsen, 1958).

Administration and Types of Steroids Used

For conditions affecting the outer structure of the eye, ointments or eye drops can be used. It appears that the higher concentrations produce better results. If a posterior segment of the eye is involved, parenteral or subconjunctival therapy is needed. Hydrocortisone or prednisolone (particularly the phosphate) are superior to cortisone for treating disease of the eye. Leopold (1952) and Gordon (1955) observed that by local application the peak level of steroid in the aqueous is reached at about 72 hours. Topical therapy gives a higher concentration in the aqueous as the duration of treatment is extended. Some is also found in the vitreous at a lower concentration. If therapy is stopped, there is an immediate drop in concentration of the steroid; this should be avoided. If posterior segments of the eye are involved, systemic or subconjunctival use of hydrocortisone may be indicated. By the latter route a maximum concentration of hydrocortisone is achieved at about 24 to 48 hours after injection. Such a concentration in the vitreous is higher than after topical use. Experimentally it has been shown that a level of steroid in the aqueous and vitreous similar to those obtained with systemic administration of cortisone can be achieved by subconjunctival injections. Such use eliminates repetitive treatment in some patients. The preparations so used are cortisone acetate and hydrocortisone, 25 mg. per ml., in doses of 0.1 to 0.3 ml. for dogs. For cattle 50 mg. has been used (Scott, 1957).

Some cases may respond so promptly that owners may be disinclined to bring animals for re-examination. In other cases relapses may occur, particularly if degenerative changes are already present. Combination of hydrocortisone and neomycin is advised for many eye conditions.

3. Ear Diseases

Many reports indicate that acute inflammatory ear conditions may be alleviated by the use of corticosteroids (Martin, 1954; Roger, 1957; Moon, 1954; Schultz, 1955; Hopkins & Lerch, 1955, and Roncalli, 1958). Immediate response may sometimes be obtained from topical application of hydrocortisone. Reduction of pain, of swelling and of exudation is observed, and healing appears to take place more rapidly.

Conditions Treated

Mainly otitis externa—the eczematous traumatic and allergic types.

Some fairly advanced cases of ulceration of the ear canal and aural resection have also been treated.

In some cases treatment may have to be continued for over a week and discontinued gradually. The conjoint use of antibiotics such as neomycin is advisable. In acute extensive otitis, parenteral use may also be indicated. Relapses have been reported in a few treated cases.

Corticosteroids in Orthopaedic Medicine

Hench (1949) recorded spectacular results on treating rheumatoid arthritis in man with cortisone. Since then medical literature on the subject has become extensive. In our profession such uses are also well recognised, and much clinical information and published work (from America) is becoming available. The exact action of these steroids in arthritis, etc. has not been fully worked out. Kendall (1956) stated that "what physiological processes are modified by cortisone and how the influence is exerted are matters still locked within the hormones of the adrenal cortex." Whatever may be the final evaluation of these substances for the treatment of man or animals, it is recognised that in many conditions they are used to remove useless inflammation and so reduce pain.

Conditions Treated and Corticoids Used

Hydrocortisone or prednisolone in combination with an antibiotic, such as neomycin, are used for local infiltration into joints, tendons and muscles, if these are accessible, or if a single lesion is present. If, however, lesions are multiple or inaccessible, then parenteral therapy is needed.

Conditions treated with these substances are :

Arthritis,
Osteoarthritis,
Periostitis (splints, sore shins),
Bursitis,
Synovitis (bogspavin, hygroma, capped hock, "thoroughpin"),
Tenosynovitis,
Tendonitis,

Few cases of navicular disease, Wilkins, 1957. (Dillon, 1956; Misner, 1953; Moon, 1954; Kingrey, 1955; Montash, 1957; Wheat, 1955; Paterson, 1957; Wilkins, 1957.)

In small animals the treatment of arthritis, osteoarthritis, synovitis, sprains and "lameness" of unclassified aetiology have been reported (Moon, 1954; Davidson, 1954; Glenney, 1957; Misner, 1953; Martin, 1954; Singleton, 1958; and Wilson, 1958). Several clinicians in this country have also reported good results with corticosteroids in treating small animals. Wilson (1958) reported good results in 3 cases of paraplegia when other treatments had either failed or been succeeded by relapse. Prednisolone given orally produced remission of symptoms, although in 1 case euthanasia had been requested and the remaining 2 appeared hopeless. Several clinical reports of such results are available. It is, however, recognised that not all cases of paraplegia can be treated with corticosteroids. If for instance a disc protrusion is present and has caused irreversible damage to the cord, either by pressure or by interference with its blood supply, then these substances cannot be expected to have any effect on the lesion.

Singleton (1958b) reported 10 cases in which peri- or intra-articular injections produced remission of symptoms in ruptured medial meniscus, post-traumatic hydarthrosis, sprain of supraspinatous muscle even when small calcification was present, hip lameness from an early arthritis, and for *symptomatic* relief in an animal that showed "rarefaction" of acetabulum and had ultimately to be destroyed.

Many reports are available on the successful use of these steroids in the stifle lameness in dogs. In one trial, out of 17 treated, 15 made complete recovery. Joshua (1957) described the technique of intra-articular injection. Singleton (1958a) illustrated this and peri-articular injections of the hip and shoulder joints. Clinicians can soon master the technique of joint injections. Positioning of the patient is important; good narcosis, anaesthesia, aseptic technique and the use of sharp needles to avoid trauma, are all essential. Glyn (1957) in discussing some aspects of intra-articular therapy has listed some evidence to show that hydrocortisone in joints exerts anti-inflammatory action. He showed that in man hydrocortisone (a) greatly reduces the cell content of synovial fluid and inflammatory infiltration, (b) causes the viscosity of synovial fluid to return to normal, (c) rapidly disappears from the joint (only about 2 per cent. is detected in the fluid 3 hours after injection) and that a large proportion of injected steroid is present in the synovial membrane.

The orthopaedic use of these drugs is only beginning. Additional aspects, such as the use of water-soluble prednisolone phosphate for soft tissue injuries, the use of steroids in racing animals, the type of meniscal damage treated by hydrocortisone that does not relapse, etc., still await further elucidation. Their uses in large animals have still to be tackled. It is certain that such uses will be rewarded, either by good response or by showing the necessity for more detailed diagnosis, often by X-ray. Clinicians will learn to distinguish the hopeless cases in which relapse or lack of response will prove these drugs of little value.

Mastitis

In America hydrocortisone and prednisone have been used in intramammary formulations, in combination with antibiotics and at times with sulphonamides (Vigue, 1955; Foley, 1957). Vigue (1955) reported favourable results in which convalescent time was reduced by 25 per cent. and the percentage of cures was higher by 20 per cent. Wilson (1958) in a controlled trial used a combination of penicillin with streptomycin and 25 mg. hydrocortisone sodium succinate and compared its use with that of a similar preparation without hydrocortisone. Milk samples were taken before and after treatment; as far as possible each case was visited for clinical examination and assessment of the condition of the udder within a week of treatment. The results of this trial were summarised as follows : "there is little indication that the addition of hydrocortisone to the antibiotics had influenced the course of the disease."

In addition, some practising veterinary surgeons were interested in the American claims for use of hydrocortisone in mastitis. Forty-two cases of mastitis (no bacteriological examination of milk samples was carried out) were treated with a similar preparation as in the controlled trial. Only 4 cases responded more quickly to the hydrocortisone formulation.

In view of the above results it appears that the inclusion of hydrocortisone in an intramammary preparation did not produce the improvement reported in the earlier work in America. This indicates once again the importance of evaluation under British field conditions.

Bovine Ketosis (Acetonaemia)

Many reports are available on the use of corticosteroids in this condition. A brief review of these may help to clarify the position and possibly assess some of the claims made for their effects. The rationale for their uses in ketosis has been based on their glucogenic effect, but some speculation still remains about their exact physiological action in this condition.

Acetonaemia or ketosis in cattle is now regarded not as a specific disease, but as a metabolic disorder resulting from an imbalance between the nutritive intake and the nutritional requirement of the animal (Dye & Dougherty, 1956). Clinically the condition is characterised by loss of milk, anorexia and loss of weight; biochemically by hypoglycaemia, depletion of liver glycogen, fatty infiltration of the liver and ketonaemia.

Soskine & Levine (1952) stated that "the fundamental disturbance underlying all ketosis is a relative or absolute lack of carbohydrate in the liver leading to an excessive breakdown of fat." Sampson (1956) suggested 2 main concepts of this condition:

i. Carbohydrate deficiency;

ii. Adrenal insufficiency.

A great deal of evidence is available in support of the first suggestion and need not be discussed here.

The concept of ketosis as an endocrine disturbance put forward by Hatziolos & Shaw (1950) was based on Selye's hypothesis (1946) that dysfunction of the pituitary-adrenocortical system leads to "diseases of adaptation," resulting in tissue changes, which he regarded as characteristic of the alarm reaction phase of the adaptation syndrome. Shaw *et al.* (1950, 1951, 1955) reported that the gross and microscopic changes found in the tissues of cows in various stages of ketosis were similar to those described by Selye (1946). As a result of these findings and of successful treatment of ketosis with cortisone and ACTH (1951), these workers postulated that "bovine ketosis is due to an adrenal insufficiency involving the adrenal cortex and the anterior lobe of the pituitary gland." In addition they claimed that "cows which do not exhibit good response to adrenocortical hormone therapy, either do not have primary ketosis or have ketosis complicated by other abnormalities."

Sampson (1956) reviewed the evidence for and against carbohydrate deficiency and adrenal insufficiency as causes of acetonaemia. He questioned the validity of Selye's hypothesis and produced evidence against the conclusion that disease considered by Selye to be due to maladaptation to non-specific stress is caused by insufficiency of corticotrophin and adrenal corticoids. Sampson concluded that the available evidence supports the view that carbohydrate deficiency and not adrenal insufficiency is of major importance in the aetiology of bovine ketosis.

Shaw *et al.* reported the treatment of 75 cases of ketosis with various doses of cortisone injected intramuscularly. The usual pattern of response was shown by increased blood glucose, rising to within normal in 8 to 10 hours and to above normal within 24 hours, remaining above normal for 2 or more days and levelling off. Blood ketones usually returned to normal by the 3rd or 5th day. Milk production improved after 2 to 3 days. Appetite improved within 18 to 24 hours. (Eosinophils dropped during the first day of treatment and then rose to normal.)

Since this initial work of Shaw *et al.* on cortisone therapy in this disease, there has been an increasing amount of evidence, mostly from America, on the use of glucocorticoids in the treatment of ketosis.

Dye *et al.* (1953) reported successful treatment with cortisone in 13 cases of acetonaemia, but considered it extremely unlikely that this disorder is due to adrenal cortical deficiency. They suggested however that in ketosis the requirement of the animal for adrenocortical hormones may be increased, so that a relative adrenal insufficiency may then exist. In their view the histological changes occurring in the adrenal and the anterior pituitary indicate a physiological compensatory hypertrophy and hyerplasia.

Vigue (1955) evaluated 9 different treatments, which included the administration of glucose intravenously or of glycerol and sodium propionate orally and cessation of milking, the use of ammonium lactate and potassium chlorate orally and the use of ACTH and cortisone and "ketogestin" (hormone related to cortisone) by the intramuscular route. From this trial Vigue concluded that no one treatment was always effective and that most treatments appeared to cure some cases. It was not considered that adrenocortical hormones are a specific treatment; since spontaneous remission can occur, he emphasised that caution should be exercised in evaluating any treatments for this condition.

After the introduction of Δ-derivatives, Vigue (1956) reported that prednisone gave greater and more prolonged glycogenic effect than cortisone or hydrocortisone. A marked stimulation of appetite and resumption of feeding was also noted. Similar results were obtained by Morris & Hall (1956) and by Shaw (1956). Although Vigue (1956) does not completely agree with the hypothesis of pituitary-adrenal insufficiency in this condition, he does consider that these hormones are useful therapeutic agents.

Link *et al.* (1957) first reported the use of prednisolone acetate in ketosis. They found that 27 to 32 cows (84 per cent.) recovered when given 100 mg., and 6 out of 8 on 50 mg., without additional treatment. The blood glucose values at 24 and 96 hours after treatment were well above the pre-treatment levels, and blood ketones were decreased. An appetite-stimulating effect was noted. Even though prednisolone treated cows returned to full production more slowly than cows responding to glucose therapy, these authors still considered that prednisolone has advantages over some types of treatment in this condition, because of the ease of administration as well as the effects achieved.

In this country similar satisfactory results with prednisolone have been reported by Paterson (1957). A single dose of 100 mg. of prednisolone appeared to be satisfactory, but some cases responded to less; others required up to 200 mg. per injection, but no details of supportive treatment were given.

Vigue (1958) reports now that a new synthetic glucocorticoid, prednisolone trimethylacetate, gives a greater hyperglycaemic effect than even prednisolone acetate and appears to stimulate the appetite.

In all these reports it is accepted that the rationale for using glucocorticoids in ketosis is based on their glucogenic effects, but Adler & Dye (1957) point out

that these substances are versatile pharmacological agents with other actions that may contribute to the recovery of the animal, including the non-specific effects, such as stimulation of appetite and a feeling of well-being, which may provide a transient stimulatory effect and may contribute to the recovery of the animal.

Dosage of Glucocorticoids in Bovine Ketosis

The recommended rate of corticoid dosage varies. Adler & Dye (1957) consider that this can be expected "when a non-specific sign is elevated to the dignity of a disease, and then treated with an extremely versatile non-specific therapeutic agent." They emphasise the importance of recognising the precipitating factor, which should be specifically treated, though glucocorticoids can still be given at the same time. When this is done, it is possible that smaller doses of corticoids may be effective.

Recent evidence suggests, therefore, that glucocorticoids, particularly the newer compounds, are useful agents in the treatment of some cases of bovine ketosis, because of their ability to mobilise body reserves and stimulate gluconeogenesis to meet the increased metabolic requirement of the cow during a state of nutritional imbalance at a period of maximum milk production. Stimulation of appetite may also play an important part.

The exact metabolic changes giving rise to clinical ketosis are not fully understood. The biochemical chain of events that result from the use of glucocorticoids needs further elucidation, although several theoretical explanations have been recorded. If from all the available evidence it is now accepted that the primary cause of this metabolic upset is an imbalance between food intake and bodily requirement, then it is essential that clinicians should pay attention not only to the treatment of this condition but also to the nutritional status of the individual patient and the herd. Adjustment of the diet may be of great help in preventing relapses after initial response to whatever form of treatment had been used. This is particularly important in high-yielding animals, which are expected to give a higher milk production than ever before.

In this country clinical results with glucocorticoids for this condition seem to differ in different areas. Some clinicians appear to obtain good results in early cases and no success in refractory ones; the experience of others is just the reverse.

Future work should include further controlled trials. It should also aim at preventing this condition, which will require further knowledge of the intermediary metabolic processes of ruminants.

Further work is also needed on the treatment and prevention of pregnancy toxaemia in ewes, treatment of which has paralleled that of bovine ketosis. The use of glucocorticoids in pregnancy toxaemia, however, is not sufficiently elucidated. Holm (1958) found that cortisone and hydrocortisone given to ewes suffering from this disease produced no change in the blood glucose or ketones, compared to untreated animals in similar stages of the disease. In practice the use of glucocorticoids in this disease appears to be disappointing.

Use of Corticosteroids in Other Conditions

Clinical and published reports indicate that these substances are being used to treat a wide variety of diseases. There have been reported distemper, eosinophilic myositis, burns, leukaemia, enteritis, peritonitis, pneumonia, shock and infections. Most reports describe clinical impressions. The number treated was not very great and control was difficult; for the present such uses can merely be noted pending the availability of further information. The use of these drugs in infection and shock deserves special mention.

In Infection

It is now known that the use of adrenal cortical hormones can have both beneficial and detrimental effects in infectious diseases. They can lower the resistance to infection with various organisms or even disseminate localised infections. Most of the work with these hormones in infections has been done on laboratory animals receiving fairly high doses of steroids so that not all the experimental findings can be compared with the clinical use of the steroids in practice. The dangers of steroid therapy should, however, always be remembered; in these infections appropriate antimicrobial treatment is essential. It is also known that the adrenal cortex responds to many unrelated stimuli, including infection. This stimulation presumably results in increased activity of the adrenal gland in the early phase of the disease (the alarm reaction) and hypoactivity or a state of exhaustion in the later phase. On this suggestion a relative subclinical adrenal insufficiency may be suspected in several diseases. Heilmeyer (1954) reported that an increase in the production of adrenal hormones is necessary for increased resistance to bacterial toxins.

It has also been noted that peripheral vascular collapse can be associated with severe infection, and Rich has recorded the histological changes that then take place in the adrenals. Moreover Robinson (1956) has reported that, in laboratory animals, cortisone and hydrocortisone counteract "the lethal effect of bacterial endotoxins elaborated by a variety of pathogenic bacteria." This result was attributed to an antitoxic effect. Kinsell *et al.* (1955) postulated that this "non-specific antitoxic effect" could be attributed to the anti-inflammatory action of corticosteroids and that possibly some products of inflammation could be responsible for systemic toxicity in infectious diseases.

In some patients undergoing treatment for arthritis, a sense of well-being, at times amounting to elation, has been observed. Apparently this was not related merely to relief of pain. The same state of well-being has been noted during the use of corticoids in people suffering from infectious diseases, collagen diseases, leukaemia or pneumonia and even cancer (Spink, 1957). As a result of all these observations corticosteroids have been used in selected cases of infectious diseases, but this is permissible

only if full antimicrobial therapy is initiated and maintained for longer than the use of steroid.

In the medical literature many reports describe such supportive use of these drugs (Kass, 1953; Robinson, 1953; Germuth, 1956). Kinsell (1955) describes 5 years of experience in treating more than 300 patients. Spink (1957) reviewed over 1,000 medical reports on such uses in his publication, "ACTH and adrenocorticosteroids as therapeutic adjuncts to infectious diseases." Moreover, in man treatments of pneumonia by penicillin with and without hydrocortisone have been compared, Wagner *et al.* (1956). In the hydrocortisone-penicillin group "quicker symptomatic improvement and greater comfort during the acute phase" was recorded. Bailey (1958, U.S.A.) used corticosteroids for supportive treatment in a number of conditions in which "stress" and infection were diagnosed. These included acute mastitis, metritis, severe foot-rot, systemic infections, inflammatory conditions, including arthritis (traumatic gastritis—rumenotomy) and shock. Further evaluation is required for this form of supportive therapy with corticoids.

Some Recommendations for Action when Steroids are Used in Infection

1. Having established a diagnosis (bacteriological, if possible), initiate an appropriate intensive therapy "on the basis of proven or probable aetiology" (Kinsell, 1955).

2. Continue antimicrobial therapy for a few days after discontinuing corticoid dosage.

3. Consider the diet and all adjunct therapy needed for treatment of the patient as a whole.

It appears that in certain diseases the clinician can, by judicious use of these drugs for short periods, prevent fatalities in man. The same potentialities and responsibilities apply to the use of these valuable and potent substances in veterinary medicine. It is accepted that in such cases these steroids may only modify a pathological state, but that their use conjointly with more specific drugs and to support the patient's own resistance appears to give a better chance of overcoming disease.

In Shock

Occasionally some cases of shock do not respond to the usual standard treatment with blood plasma volume expanders or vasopressor agents. This may lead to irreversible shock and death. Medical opinion indicates that acute adrenal insufficiency may be an important factor in post-operative shock that does not respond to the usual treatment. Selye's concept of stress may well be a pointer to the importance of the adrenal cortex in the physiopathology of shock.

During surgery and anaesthesia the adrenal cortex is activated and this may ultimately lead to an exhausted adrenal and possible reduction of circulating corticosteroids. It has been suggested that the effect of cortisone and hydrocortisone in shock may be due to their ability to increase capillary resistance, which is necessary to maintain the tone of the vascular bed. It has also been postulated that cortisone has a potentiating effect on vasoconstrictor agents (Fritz & Levine, 1951). If cases of shock do not respond to the usual treatment, then an intravenous or intramuscular use of a suitable corticosteroid should be tried. No harmful effects have been reported from high doses of circulating corticosteroids for a short time. Effective uses of these substances may be life-saving and depends upon early recognition of the clinical condition of shock. Hormonal therapy in shock should be considered as an adjunct to the standard method of treatment, and antibiotics must be included when bacterial disease is also present. Kerr (1954) suggested that adrenal cortical hormones "may have some application in shock therapy." Clinical evaluation of this suggestion is desirable.

Contra-indications

Corticosteroids are potent hormonal substances, and side effects can arise unless their use is accompanied by safeguards.

In veterinary medicine they are unlikely to be used for long periods, and occurrence of side effects should be infrequent. Moreover these side effects are reversible once treatment is discontinued or stopped.

It is advisable to know the patient's previous history of disease, and whenever possible to eliminate co-existing infection and renal or cardiac impairment. The clinician should also be aware that during full corticosteroid therapy tissues may become less resistant to infection. Since the usual symptoms of infection may be suppressed by the anti-inflammatory effect of the hormone, infection may spread rapidly without detection.

It is possible that high or excessive doses may lead to sodium and water retention, and increase potassium excretion, leading to sickness, diarrhoea and oedema (Jones, 1956). In cats rapid pulse, vomiting and prostration have been noted. In a few cows excessive urination and restlessness have been noted.

The Main Contra-indications

1. Cardiac and renal impairment.

2. Degenerative eye disease.

3. Infections during treatment, unless full antimicrobial specific therapy is included, and supervision by the clinician is available.

4. Sudden withdrawal of these substances during treatment. Since endogenous adrenocortical secretion is under the control of ACTH, and administration of corticosteroids suppresses secretion of this hormone and therefore also endogenous adrenal secretion, the sudden withdrawal of corticosteroids during treatment may lead to a setback in the patient's condition.

It is possible that other contra-indications will be reported when these substances are being used on a more extensive scale.

Conclusion

In this paper an attempt has been made to summarise some of the available information on the use of corticosteroids in veterinary practice.

In the treatment of some eye and skin diseases, these substances rank as important ancillary aids to good therapy, frequently saving the tissue involved and alleviating both the discomfort of the patient and the anxiety of the owner. In many other conditions, further reporting and critical evaluation of results are essential. Moreover, since these substances do not cure disease, but merely reverse or suppress symptoms, it is essential that differential diagnosis and adjunct therapy should be considered. The side effects should be recognised, but their significance should not be exaggerated.

It has been said that in man the use of cortisone and its derivatives has created a scope of action and versatility "wider than that of any other therapeutic agent" (Hench, 1956). It is fortunate that veterinary application of these steroids is being extended here, at a time when the knowledge of their experimental and medical uses are so well advanced. The numerical recording of successes and failures in different conditions will help in evaluating these steroids.

It is possible that not only will future work prove these substances to be useful for their therapeutic effects in some diseases, but also that in using them a better understanding of disease processes may be acquired.

Acknowledgment.—I thank Mr. Singleton for permission to use his slides, Mr. Dalton for opening this discussion and many Veterinary Surgeons for use of their clinical cases. I also thank the Department of Biochemistry, Central Veterinary Laboratory, Weybridge, for interpretation of some of the metabolic findings relating to the use of corticoids in acetonaemia.

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The Bovine Allantois

BY

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THE allantois grows out from the embryonic hindgut and disposes itself between the chorion and amnion with which primitive membranes its outer and inner layers fuse to form, respectively, the allanto-chorion and allanto-amnion. In the case of the foetal horse the allanto-chorion and allanto-amnion remain as separate sacs except where they are joined at the umbilicus, but in the bovine species an extensive fusion occurs between them so that the cavity of the allantois becomes restricted to a narrow channel which runs over the lateral face of the amnion. The shape of the allantois then resembles the letter T, the stem of the letter being formed by the stalk of the allantois—which is continuous with the urachus—and the cross-bars by the limbs of the allantoic channel previously referred to. This, at any rate, is the state of affairs up to mid-term. The different relationship of allanto-chorion to allanto-amnion between the mare and cow is advanced as the reason for the foal commonly, but the calf never, being born in its amnion.

Yet clinicians who watch normal cows at parturition will see that approximately 20 per cent. of them (in the writer's experience) give birth to the calf so that when it is expelled it is enclosed to a variable degree in a transparent membrane—presumably allanto-amnion. There would seem to be two explanations for this phenomenon. Either the original relationship of allanto-chorion fused to allanto-amnion is not sustained in late gestation, or separation of the two membranes occurs at birth. In the writer's view both may operate. In respect of the first possibility, if the pregnant bovine uterus is examined *post mortem* at 6 to 7 months gestation it will be seen that the allantoic cavity is no longer restricted to a narrow channel but occupies the whole of the lateral face of the amnion; at 8 months it covers the dorsal as well as the lateral aspects of the amnion, while during the last month there is further extension down the medial surface until only the ventral aspect remains uncovered by allantoic fluid (Table I). This progressive widening of the allantois is believed due to the increasing pressure of the accumulating allantoic fluid whose volume becomes greatly augmented in the last third of pregnancy (Arthur, 1957). It seems that the greater the accumulation of fluid the more the allanto-chorion becomes separated from the allanto-amnion. Thus in an observed case of bovine *hydrops allantoii*, the amnion was almost free inside the allanto-chorion—as it is in the horse.

TABLE I

DATA OBTAINED *Post-mortem* FROM GRAVID BOVINE UTERI

F.B.L. (cm.)	Gestation (days)	Allantoic width (cm.)	Allantoic fluid (ml.)	Remarks on allantois
7·3	63	3·5	260	
10·5	70	4·5	165	
35	142	10	3,000	
47·5	163	11	3,000	
60	198	—	4,200	Covers lateral face of amnion
72·5	220	—	4,800	"
80	—	37·5	8,100	Covers lateral and dorsal face of amnion
85	239	50	9,000	Covers lateral, dorsal and medial face of amnion

Any separation of the allanto-amnion from allanto-chorion which occurs in late gestation may be extended during labour. For during the expulsive second stage, while the allanto-chorion remains fixed by the cotyledonary attachments to the uterus, the uterine contractions tend to force out the amnion through the ruptured cervical pole of the allanto-chorion. Thus a great tension is placed on the line of apposition of allanto-chorion and allanto-amnion and the remaining fused area may be progressively separated as expulsive labour proceeds until the amnion becomes detached and slips out of the vagina with its contained foetus. That such a phenomenon is feasible may be learned from *post-mortem* manipulation of the foetal membranes of advanced gestation when it will be seen that moderate force applied at their junction will separate the membranes.

Hence the calf, like the foal, may be born in its amnion.

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THE REGISTER OF VETERINARY SURGEONS

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XUM

A Case of Acute Gastric Tympany

BY

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A CASE of acute gastric tympany due to rotation of the stomach, following the herniation of the intestines through a diaphragmatic rupture is described.

It is felt to be of interest in view of its cause. Although it is well known that diaphragmatic rupture may occur without herniation and without obvious symptoms, the period of time which elapses before herniation occurs may lead the clinician to miss the true nature of a case which appears at first to be a simple gastric tympany.

A further point of interest lies in the fact that the stomach itself in this case was not herniated but was rotated following the herniation of the intestines.

Subject. 3-year-old, smooth haired terrier cross : bitch. Weight approximately 35 lb.

History. Apparently normal all day, this bitch had eaten a good meal at midday and had been for a walk in the afternoon. At 6 p.m. the owner had noticed that the dog had a distended abdomen, and by 7 p.m. this was causing it some distress.

Examination. The dog was examined at 7.30 p.m. and was in great distress. Temperature was 99.5, respiration very laboured and pulse fast. The abdomen was distended to the maximum that the skin would permit. Auscultation of the chest showed no sounds on the left side, and increased heart sounds on the right side. Percussion of the abdomen led to a diagnosis of acute gastric tympany. During examination the dog was making repeated, feeble, but unsuccessful, attempts to vomit.

Treatment. The dog's distress was increasing so rapidly that it was decided to induce light anaesthesia and to attempt to pass a stomach tube. With this in mind, 0.25 gm. thiopentone sodium was dissolved in 5 c.c. water, and intravenous administration was begun. After 2 c.c. (less than 0.125 gm.) had been given, the dog collapsed and respiration ceased. It was immediately obvious that artificial respiration by manual pressure on the chest would be useless, so a No. 8 cuffed Magill endotracheal tube was passed into the trachea, the cuff was inflated, and positive pressure breathing was commenced.

In spite of this, cyanosis appeared, and the heart stopped beating. Further attempts at revival were unsuccessful.

Post-mortem examination. This was carried out almost at once, and before opening the abdomen, some of the gas was released from the stomach by passing a No. 14 hypodermic needle directly through the abdominal wall.

On opening the abdomen it was found that the stomach had rotated 270 degrees (around an axis parallel with the spine) and was lying with the greater curvature in contact with the linea alba, the pylorus touching the pelvic brim. From this position the duodenum ran anteriorly to a hole in the diaphragm. This hole was roughly circular, 2″ in diameter, and was bounded on two sides by the sternum and one rib. The diaphragmatic side of the hole was fibrosed and this condition appeared to be of long standing. Part of the omentum was firmly anchored to a small area ½″ in diameter just dorsal to the hole in the diaphragm. The remainder of the omentum, fat and intestines (excepting the colon and part of the duodenum) had passed through the hole in the diaphragm, and was lying in the left side of the thoracic cavity. On withdrawing the bowel it was found to be already purple-black in colour. The stomach, which was so distended that it filled the entire abdominal cavity, was half filled with gas, and half with a thick viscous froth such as is seen in "frothy bloat" in cattle.

Discussion. Following the *post-mortem* examination, the owner was questioned as to whether the dog had been involved in an accident. It appeared that it had, in fact, been knocked down by a motor car 5 months previously, but the only injuries apparent at the time were a cut necessitating 3 sutures, and a slight lameness which soon disappeared. The dog appeared to make a complete recovery, and no respiratory distress was noticed at any time.

It is of interest to consider the possible causes of the delayed train of events, and the most plausible explanation would seem to be that, following the accident, the rent in the diaphragm was immediately occluded by omental fat which remained attached at only one spot for 5 months. After the brisk exercise on the day of its death, during which the dog went for a long walk, the fat and omentum were dislodged through the hole into the left thoracic cavity, dragging part of the small intestine after it. Peristaltic action might then account for the remainder of the bowel entering the chest, and in so doing, exert a pull on the stomach which could cause it to rotate.

Rupture of the diaphragm is not diagnosed very frequently considering the large numbers of dogs and cats that are involved in road accidents ; when it is seen clinically it usually follows severe injuries, or it is discovered after collapse under general anaesthesia during unrelated surgical interference.

It does seem possible that rupture of the diaphragm without immediate herniation may occur more frequently than is at present realised, and in view of the tendency for such cases to remain symptom-free until some herniation occurs, it is hoped that this article, by drawing attention to the condition, may stimulate other practitioners to consider the possibility of diaphragmatic rupture after street accidents and thus increase the chances of an early diagnosis.

Some cases may not even be brought in at the time of accident and here early diagnosis is clearly impossible but the clinician confronted with the acute gastric tympany without obvious cause may find it worthwhile to consider the possibility of diaphragmatic hernia and to have positive pressure breathing apparatus at the ready when operation is undertaken.

It is interesting to speculate whether the release of the gas by a wide bone needle had been undertaken at once it would have allowed a chance of safe anaesthesia.

Current Literature

ABSTRACTS

The Effect of Malucid on Canine Pregnancy. WHITNEY, LEON F. (1959). *Vet. Med.* **54.** 25.

Malucid is a new antibiotic derived from yeast, and in the course of testing it for toxicity the unexpected property of terminating pregnancy was observed following intravenous injection into dogs and mice (but not in rabbits and rats). It was 100 per cent. effective in 8 bitches in one of whom it was used to terminate 4 successive pregnancies. Most of the bitches studied were sacrificed and examined *post mortem*, but this did not reveal the mode of action beyond indicating an interference with placentation: 48 hours after injection the foetal membranes were necrotic, foetuses were degenerating, and foetal fluids resorbed. At no stage was the cervix open.

Although the drug appeared reasonably free of long-term effects it produced a very severe acute reaction reminiscent of peptone shock, with hypotension, dizziness, hyperpnoea, emesis, and prostration lasting some hours. Similar, but less severe reactions were obtained with only one tenth of the dose used to terminate pregnancy, but after such small doses a large assaulting dose elicited no further shock-like reaction. The author suggests that this refractory or desensitised state may be created by giving very small doses over several days, thus permitting the ultimate use of a large pregnancy-terminating dose.

This report is of a preliminary nature and further work is in progress.

R. J. F.

Salmonella Organisms in Animal Feeding-stuffs and Fertilisers. Report (1959). *Mon. Bull. Min. Hlth Publ. Hlth Lab. Serv.* **18.** 26.

Animal feeding-stuffs and organic fertilisers, imported and home-produced, 1,262 samples in all, were examined for Salmonella organisms in a number of laboratories in Britain. Specimens, in 10 to 20 gramme amounts, were incubated in selenite broth or other enrichment media for 1 to 4 days and then sub-cultured on to Wilson and Blair's bismuth sulphate agar or desoxycholate-citrate agar.

Salmonellae were frequently found in a wide variety of products, including raw and processed materials and complete feeding meals and fertilisers. For example, 47 (14.9 per cent.) of 315 samples of fish meal and 28 (16.3 per cent.) of 172 samples of meat meal, both type of products destined exclusively for animal feeding, were found to be infected with Salmonellae. The infection rate for bone products intended for either animal feeding or fertiliser was 48 per cent. and that for complete foods, including those for calves, pigs, turkeys, chickens, cats, and dogs, was 8.4 per cent. Imported food supplements, particularly bone meal and Angola fish meal, were much more commonly found to be infected than were "home-produced" supplements. There was evidence that some satisfactorily processed material may be contaminated with Salmonellae from factory dust and sacks.

Viable counts made on a number of different types of supplement were low, being usually less than 100 Salmonella organisms per 100 grammes.

Altogether 88 different serotypes were isolated, including 6 types not previously described. With the exception of *Salmonella typhi-murium*, the serotypes commonly associated with animal disease were rarely isolated. *S. pullorum, gallinarum,* and *cholerae-suis* were never found and *S. dublin* and *thompson* were each found on only one occasion.

(Abstractor's note: The media employed were not the most suitable for the isolation of S. cholerae-suis.)

H. W. S.

REPORT

Annual Report of the Veterinary Department, Tanganyika, 1956

This Report is published in two volumes. The first, by Mr. E. C. S. Dawe, M.R.C.V.S., the director of veterinary services, gives an overall picture of the livestock industry in Tanganyika and the part his Department plays in promoting its welfare. The second, by Mr. R. M. Arnold, B.SC., M.R.C.V.S., chief veterinary research officer, provides a more detailed account of the work done by the research branch of the Department on a wide variety of subjects from animal diseases to tick control, pasture development, livestock breeding, nutrition, management, and physiology. Volume II also contains statistics of the livestock population, sales, and trade in the territory. Together these two volumes form a most informative record of a year's work into which a great deal of effort, often under difficult conditions, was put.

Tanganyika territory, a country larger than France and Germany together, much of it uninhabited, tsetse infested, and waterless, and with a scattered population of some 6,000,000 Africans in many diverse tribes and about 80,000 Asians and Europeans, is administered by Great Britain under United Nations trusteeship. Its livestock, totalling some 7,000,000 cattle, 7,000,000 sheep and goats, 126,000 donkeys, 11,500 pigs, and 200 horses, of which virtually all except the horses and nearly half the pigs are African-owned, constitutes one of the country's most valuable resources.

Animal Health. The outstanding feature of 1956 was that this was the first year in which no case of rinderpest was detected in the territory. By the end of the year there had been freedom for 19 months, and there was good reason to believe that at long last rinderpest had been eradicated from Tanganyika, an achievement in which the Department can justifiably take great pride. For many years Tanganyika has borne the grave responsibility of preventing the spread of rinderpest southwards to the Rhodesias, Nyasaland, the Union of South Africa, and other territories, and the fact that the

lower limit of the disease has been pushed northwards and the threat to these countries further reduced, is a matter of considerable importance not only to Tanganyika but to them as well.

Mr. Dawe pays tribute to the Kenya and Uganda veterinary departments for their co-operative control measures, and to the Kabete laboratory and the East African veterinary research organisation for the supplies of anti-rinderpest vaccine in the past. At the same time he wisely draws attention to the ever-present risk of re-infection, particularly through the agency of nomadic Masai cattle herds and susceptible game animals entering from Kenya.

Hopes of eradicating contagious bovine pleuropneumonia, which at the beginning of the year was believed to be confined to one quarantine area in Masailand, received a serious setback when several new foci of infection were discovered outside this area. Despite the extension of quarantine measures the disease spread rapidly during the next 6 months and the position worsened when a new avianised "tail-tip" vaccine which had appeared satisfactory in a field trial failed to reach expectations when put into general use.

Progress was, however, made in the control of tick-borne diseases, of which East Coast fever is the most important. Dipping and spraying are widely practised. Much valuable experience has been gained from the Iringa dipping scheme which has shown that a 7-day interval dip of 100 p.p.m. gamma isomer concentration is a practical and economical method of controlling East Coast fever in enzootic areas in Tanganyika. Provided that the co-operation of cattle owners in paying for the service and in preventing over-stocking is assured—prerequisites for success that are not, unfortunately, always readily forthcoming from all tribes—the intention is to extend the dipping programmes. During the year East Coast fever surveys, details of which are given in Volume II, were carried out in several provinces with this aim in view.

The whole problem of tick control is one of considerable magnitude in Tanganyika. That progress is, however, being made is shown by the fact that in the 5 years in which the Iringa dipping scheme has been in operation immersions have risen from 162,000 in 1951 to 9,500,000 in 1956. In addition to the 59 tanks operated under this scheme 65 other Government tanks and spray races, and 193 privately owned tanks and races were in operation in other parts of the country.

Trypanosomiasis was encountered in all provinces and nearly 50,000 inoculations were carried out by departmental staff, a considerable increase on previous figures; many owners also treated their own animals.

Anthrax and blackquarter proved troublesome. The latter is regarded as being of serious economic importance but it is encouraging to note that African stock-owners are increasing their demands for prophylactic inoculation. Tuberculosis is of relatively low incidence in the predominantly Zebu type cattle in the country except in certain areas of one Province. Rabies was limited to the N.E. and N.W. region of the country.

Foot-and-mouth disease was widespread, every Province except one being affected, but the disease for the most part took a mild form. "O" and "A" viruses were confirmed but no "SAT" types were recorded. Outbreaks were usually dealt with by quarantine measures and mouth-swabbing; vaccination, used on some grade herds, gave a fair measure of success.

Other diseases mentioned in the Report include piroplasmosis, anaplasmosis, rickettsiosis, malignant catarrh, haemorrhagic septicaemia, and Rift Valley fever. Worm parasitism is a serious problem but there is an encouraging increase in calls by African owners for anthelmintic treatment of their stock. Phosphate and cobalt deficiencies were demonstrated in certain areas.

Animal Husbandry. It is evident from the Report that a good deal of attention is being given by the Department to this important side of the livestock industry. Such problems as over-stocking, the system of land tenure whereby all grazing land is communal, thus making it difficult for any individual to improve his animal husbandry at a faster pace than his neighbours, uncontrolled fires which annually destroy thousands of square miles of valuable grazing, and the need to confine livestock from before dusk until well after dawn in vermin-proof enclosures against predatory wild animals are all serious limitations to rapid livestock improvement. Nevertheless there are encouraging signs that progress, albeit slow in many instances, is being made, often in the face of traditional native conservatism and suspicion.

The Department puts considerable store on its field extension services whose many varied activities included promoting interest in fattening store cattle, encouraging the cultivation of fodder crops, countering over-stocking, improving water supplies, and the castration of scrub stock. These field services are backed by the Department's Government farms and its animal husbandry research services, full accounts of which are contained in Volume II.

Progress on the Government farms, at which herds of Indo-African, Boran, Jersey, and Tanganyika Zebu cattle, local and Boer goats, Wiltshire Horn and Black Head Persian sheep were maintained, continued satisfactorily. At the large Mkata ranch, which extends over 200,000 acres and carries some 10,000 head of cattle, the aim is to grade-up Zebu cattle with Boran bulls to produce a heavier and quicker maturing beef animal able to live and thrive under adverse conditions, and to produce breeding bulls in large numbers for distribution throughout the territory to improve the "national herd."

Livestock Trade. Dried and wet-salted hides and dried sheep and goat skins valued at over £1,250,000 were exported from the territory.

The Report is a most useful contribution to tropical veterinary knowledge. The addition of a map would have been helpful to a reader unfamiliar with Tanganyika.

W. E. L.

News and Comment

THE QUEEN OPENS THE ROYAL VETERINARY COLLEGE FIELD STATION

A very large and distinguished company was present at the new Field Station of the Royal Veterinary College when the Queen declared it formally open on April 20th.* The British Veterinary Association was represented by its President Elect, Mr. S. L. Hignett.

Her Majesty was received at the entrance to the Field Station by the Lord Lieutenant of Hertfordshire, the Hon. David Bowes-Lyon, who presented Sir Charles Lovatt Evans, Chairman of the College Council, and the Principal, Dr. R. E. Glover. The Royal Party, which included Lieut.-Col. Michael Adeane, the Lady Rose Baring (Lady-in-Waiting), and Lieut-Commander Campbell, R.N. (Equerry), proceeded to the portico where the following presentations were made:—

Lord Balniel, M.P., the Vice Chancellor of the University of London (Dr. C. F. Harris), the Principal of the University (Sir Douglas Logan), Mrs. R. E. Glover, the Vice-Chairman of the Council (Sir Weldon Dalrymple-Champneys, Bt.), the Treasurer (Major C. York), the Vice-Principal of the College (Professor J. McCunn), and the architects (Mr. A. H. Devereux and Mr. E. L. W. Davies).

Her Majesty then unveiled the commemorative tablet, after which she accepted the key from the Chairman and unlocked the door, declaring the building open.

The Royal party went first round the Department of Surgery, Professor Formston and Mr. G. C. Knight being presented. The Queen saw the X-ray room, where she spent some time looking at the interesting demonstration of films, and the main operating theatre, after which she passed to the large research laboratory where Professor Bosworth was presented. Next the party moved on to the operating barn, where the Queen spent some little time while Professor Formston demonstrated various patients to her, and she listened at the microphone of a metal detector which discovered a foreign body in a cow's second stomach. Her Majesty also spent some time at the loose-boxes, her particular interest in horses causing her to linger at that point.

She then passed to the Department of Medicine,

* An illustrated description of the Field Station was published in THE VETERINARY RECORD on December 20th, 1958.

The Queen is seen unveiling the Commemorative Tablet in the main portico. Opposite her is Sir Charles Lovatt Evans, chairman of the College Council.

where Professor Burrow was presented. Demonstrations by Professor Burrow and his staff had been arranged in Barn 1 (Medicine). The Queen asked a number of questions about the patients she saw both there and in Barn 2, after which she passed through the pharmacy to the preventive medicine laboratory.

Her Majesty is seen here with Professor Formston in the large operating theatre. On the left is Mr. G. C. Knight; Sir Charles Lovatt Evans is between the Queen and Professor Formston, and Mr. W. D. Tavernor is on the extreme right.

She had been cheered on her arrival by the students, but now, entering the practical laboratory, she was able to see a number of them at work. The laboratory had been so arranged that opposite each group of students was an extra microscope through which the Queen could see similar specimens to those the students were working on. Professor Burrow suggested a number of points of interest and the Queen made use of the microscopes placed at her disposal and spoke to several of the students.

The Royal tour concluded when the party returned to the entrance hall, where the following senior members of the academic staff were presented:—

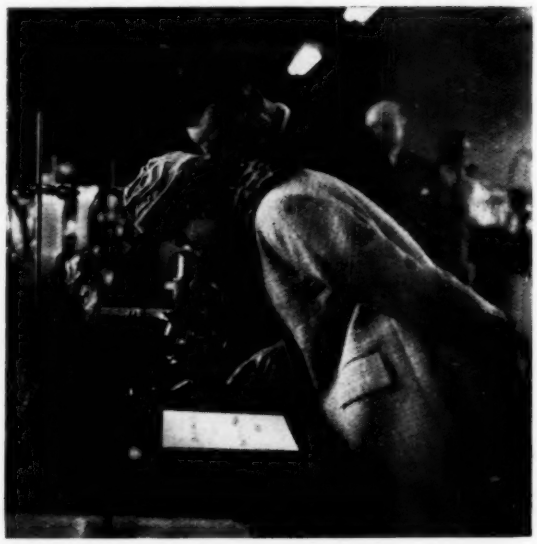
Professor E. C. Amoroso, Professor of Veterinary Physiology; Professor J. A. Laing, Courtauld Professor of Animal Husbandry and Veterinary Hygiene; and Professor R. Lovell, Professor of Veterinary Bacteriology.

Next in turn to be introduced to the Queen was Mr. H. W. J. Adams, the College Bursar and Secretary, after which Mr. C. Price Davies, the third partner in the firm of Messrs. Devereux and Davies, Architects; Mr. H. Janes, building contractor; Mr. I. E. Walker, President of the Student's Union Society; and Mrs. P. Lorenzen, President of the Women Students' Union Society were presented.

Having signed the Visitors' Book and received a bouquet from a first-year woman student, the Queen entered her car and drove away to the prolonged cheers of the large gathering present.

After the Queen's departure the Principal invited his guests to take sherry with him and Mrs. Glover, and then luncheon was served. In the afternoon the many visitors were shown round the Field Station and saw demonstrations by members of the academic staff.

This was a very happy and entirely successful occasion. The College is to be congratulated on its admirable arrangements which went without a hitch from start to finish. The Queen appeared to be interested in everything she was shown, and seemed to find her tour of inspection most enjoyable.



Professor Burrow accompanied the Queen round the large teaching laboratory which forms part of the Department of Medicine.

Our readers' wives may like to know that Her Majesty was wearing a lime yellow coat with an ocelot collar and a small lime yellow hat. Her gloves, shoes, and other appointments were black.

UNIVERSITY NEWS

Glasgow

The following candidates satisfied the examiners in the March examinations in Veterinary Pathology, Bacteriology, and Parasitology:—

Adstead, P.; Akpata, R. I.; Baxter, J. S.; Begg, T. B.; Brander, E. J. G.; Brown, A. G.; Calder, K. H.; Calver, P.; Campbell, J.; Dalgleish, Miss M. O.; Doull, Mrs. L. J. R.; Paul, S. L.; Reid, W. J.; Rickerby, Miss N. V.; Robson, B. A.; Rumford, A. K.; and Wyllie, J. M.

IN PARLIAMENT

Monkeys

MR. LIPTON (April 16th) asked the Secretary of State for the Home Department whether he will inquire into the conditions under which monkeys imported into Great Britain are kept pending dispatch to laboratories engaged in the production of vaccines.

MISS HORNSBY-SMITH: My right hon. Friend has

no reason to think that conditions are not satisfactory. It is an offence under the Protection of Animals Act, 1911, to cause, or permit to be caused, any unnecessary suffering to a domestic or captive animal by ill-treating or neglecting it; and I am sure that those responsible for enforcing the Act will at once investigate any such allegation.

MR. LIPTON: Is the hon. Lady aware that distressing accounts have appeared showing a very heavy death rate suffered by these monkeys when they are sent from London Airport to monkey farms? Will she examine a case in which 927 animals died in the period of three months at one of these places? If those circumstances are verified, will she see that necessary action is taken to avoid this needless suffering in what is a large traffic?

MISS HORNSBY-SMITH: The hon. Member refers to a large traffic, but he will be aware of the incalculable value of these animals in the vaccines produced. I can assure him that these farms have been visited both by the police and the R.S.P.C.A. and that no grounds have been found for the institution of proceedings. I understand the monkeys are well looked after in good, hygienic conditions and are visited three times a week by a qualified veterinary surgeon. It is, however, not unnatural, in view of the change from a tropical climate, that there are a certain number of deaths.

Reactor Cattle (Slaughtering)

MR. HAYMAN (April 16th) asked the Minister of Agriculture, Fisheries and Food (1) why it was necessary for his Department to arrange for the collection of reactor animals on Easter Sunday for slaughter that day in Camborne, Cornwall;

(2) what provision is made for notifying chief public health officers of the slaughter of reactor animals for which his Department is paying compensation under the Tuberculosis (Slaughter of Reactors) Order, 1956; and

(3) to what extent reactor animals for which compensation is paid are slaughtered on Sundays; and what provision is made to ensure that the carcases of such animals are inspected before being sold for human consumption.

MR. GODBER: The day on which cattle which react to the tuberculin test are slaughtered is primarily a matter for the buyer and my Department did not arrange for reactor animals to be collected for slaughter in Camborne on Easter Sunday. I am unable to say how many reactor cattle are slaughtered on Sundays, but I am informed that this was the first occasion on record that such cattle had been slaughtered at Camborne on a Sunday.

My veterinary officers take all possible steps to see that reactor cattle in tuberculosis eradication areas are sent to slaughterhouses where an adequate meat inspection service is maintained. Occupiers of slaughterhouses are required to notify local authorities of intention to slaughter animals for human consumption. I am glad to tell the hon. Gentleman that the carcases of the animals to which he refers were inspected.

MR. HAYMAN: Is the Minister aware that his statement will cause consternation in Camborne, because I have in my hand a notification from his veterinary officer asking for the farmer to co-operate in the collection of the animals on Easter Sunday? Is he aware that 18 bovine animals condemned by his Department were slaughtered on Easter Sunday and Easter Monday and that two whole carcases had to be put aside as well as 192 lb. of meat from 14 others? Does he not consider it wrong when animals are condemned by his Department for which his Department pays compensation, that they should be slaughtered without the chief public health inspector being informed? Will he at least have that put right?

MR. GODBER: Naturally, in view of what the hon. Member has said I shall be grateful if he will let me have the document to which he has referred. I will then investigate the whole matter again. I assure him that these carcases were examined and that from the point of view of public health the public were safeguarded.

Veterinary Staff, Dorset

MR. WINGFIELD DIGBY (April 16th) asked the Minister of Agriculture, Fisheries and Food why there is now only one veterinary officer of his Department in the County of Dorset, whereas formerly there were five.

MR. GODBER: The normal complement of veterinary staff in Dorset is one divisional veterinary officer and five veterinary officers. In practice, the number available for duty in a county at any particular time varies according to the need there and elsewhere. For about one week early in March, partly on account of sickness, Dorset was left with only the divisional veterinary officer and one veterinary officer. Since then, however, three to five veterinary staff have been available in the county.

PRESENTATION TO PROFESSOR MITCHELL

With reference to our report under this heading in last week's RECORD, we are asked to say that, at the time of Professor Mitchell's appointment to the staff of the Dick School, the number of qualified teachers was 5 and not 2 as stated.

At the ceremony the Alumnus Association, whose hon. secretary is Mr. A. Spreull, presented a bouquet to Mrs. Mitchell, and we regret that this was not made clear last week.

MR. H. A. SCOTT DUNN

Mr. R. S. Townson writes:—

Several years ago I met and came to know "Scottie" well; we became firm friends. He was a charming and honourable man, with a host of friends in every walk of life. I remember particularly his kindness and understanding. He would go out of his way to help and advise his less experienced colleagues. An encouraging word and a helping hand were amongst his many virtues.

A few, but only a very few, of his associates misunderstood and consequently misjudged him. This remained a great sadness to him, a man so blessed with understanding and kindness himself.

To his charming wife, and to his son Peter, in practice at Reading, go our deepest sympathies.

He will be missed by us all, and many of us have lost a valued and fine friend.

DR. ARTHUR WALTON

Dr. Timothy D. Glover writes:—

It was with terrible sadness that I heard last week of the death of Dr. Walton. Arthur Walton was a biologist whose name will remain immortal among all those who are interested in animal breeding. As a third-year student I recall travelling all night from Edinburgh to London to hear him lecture to the Society for the Study of Fertility. This was because, even then, I found his work held great fascination. In my youthfulness I placed him alongside my other idols such as Julian Huxley, Lancelot Hogben, and John Hammond. Little did I realise then that I was destined to have the honour of working with him.

Dr. Walton was one of the pioneers of artificial insemination in cattle in this country and his work on the biology of spermatozoa is so well known that he has for years been regarded as the world's leading authority in this sphere of study. As a scientific worker he was intensely thoughtful and had a gift for reducing any problem to basic essentials. His original insight, and his imperceptible influence, have largely been responsible for the success of artificial insemination as we know it to-day.

As a teacher in research Dr. Walton was critical but inspired his students to "live" for their work. His principle was to allow his men complete intellectual freedom, to give them a chance to develop their own approach and their individual style. He never harassed us by pushing us too hard, but he quietly guided us into appropriate channels of work. Dr. Walton's knowledge of the literature in his subject was phenomenal, and his judgments of scientific endeavour were penetrating though always charitable. Many would regard him as too modest as far as his own scientific achievements were concerned.

To his students Dr. Walton was more than a research supervisor, he was a very great friend. I can honestly say that the 4 years I spent working with him were the happiest of my working life so far. From time to time he would hold us spellbound with stories of his different experiences. We heard his great praise of Florey, we heard of his introduction to Voronov, and we learnt much from some of the problems which faced him and his colleague, Dr. Hammond, in the early days. Above Dr. Walton's desk was a photograph of a statue of Spallanzani. With a wry smile he would point to it with the words "our patron saint!" Dr. Walton was a man of few words, but what he said was always meaningful and wise.

Although he was quiet, Dr. Walton held some very strong views. He was an Edinburgh man and in his youth had been deeply moved by the appalling slums which existed in the city at that time. Outside his work, therefore, his energies were devoted to improving and maintaining good standards of living for human beings. He was a member of the Girton Council in Cambridge, and together with Mrs. Walton he did a great deal to ease the loneliness of many foreign students. No racial or social barriers existed in Dr. Walton's home. Children, too, adored him, and he was often to be seen calmly concentrating on some scientific treatise in the midst of a host of noisy children who had gathered in his house or in his garden.

Perhaps, therefore, apart from his contribution to science, Dr. Walton's greatest gifts to the world stemmed from his gentleness, his understanding of human frailty, and his endless compassion for those who suffered hardship. His patience with youthful exuberance was infinite, his kindness to all men so genuine as to be rarely seen elsewhere.

The world, for scientifically it was his oyster, has lost a very fine man of science. Very many people have lost a sincere friend, and Dr. Walton's old students have lost a beloved master and colleague.

We all extend our deepest sympathy to Mrs. Walton, to Nicky, and to Sally.

THE A.H.T. CANINE RESEARCH STATION

His many friends, both within the profession and outside it, will be sorry to learn that Mr. John Hodgman, Director of the Animal Health Trust Canine Research Station, was taken very seriously ill a fortnight ago. His condition is still very serious, but he has taken a slight turn for the better.

TWO LAMB CROPS A YEAR

It is reported that successful field experiments in using hormone injections to obtain a second lamb crop a year have taken place in a Leicestershire flock, belonging to Mr. F. C. Sherriff of Lowesby Hall Farm. After 5 years' work a method has been evolved by which ewes can be brought into season artificially, and achieve a 96 per cent. conception rate. Dr. Ian Gordon of Cambridge has been co-operating with Mr. Sherriff.

When the trials were started at Lowesby a single-injection technique—which was being used on several other flocks throughout the country—was employed. Hormone injections were made on 3 alternate days in spring on ewes already suckling lambs, then on the ninth day an injection of pregnant mare serum was administered.

The treated ewes came into season within 2 days of the PMS injection and the tups were turned out on the 11th day; all the ewes took the ram within 3 days, and with this technique Mr. Sherriff obtained a conception rate of between 55 and 65 per cent.

In the next experiment the ewes were given the single injections as usual, then left for 3 days before the dose was repeated. This was last year and the percentage of ewes holding to service jumped from 60 to 96.

The final, most successful, test was carried out on cross-bred sheep only, in order to get a general picture which would be applicable to the ordinary commercial sheep breeder.

R.C.V.S. OBITUARY

We record with regret the death of the following member of the profession:—

MACGREGOR, Roderick, of Kildrummie, Betchworth, Surrey. Graduated London, July 13th, 1923. Died April 16th, 1959, aged 64 years.

PERSONAL

Births

GILL.—On April 15th, 1959, to Betty, wife of Ernest A. Gill, M.R.C.V.S., of Wakefield, Yorks., a son, Stephen Wesley.

STEVENS.—On April 18th, 1959, at White House, Babraham Road, Sawston, Cambridge, to Pat, wife of A. J. Stevens, B.V.SC., M.R.C.V.S., a daughter, Heather Frances, sister for Carol.

VOLRATH.—On March 22nd, 1959, at University College Hospital, to Margaret, wife of John Volrath, M.R.C.V.S., of Hampton, Middlesex, a daughter.

WICKS.—On April 18th, 1959, to Judith, wife of Brian Wicks, M.A., B.V.SC., M.R.C.V.S., of Chippenham, a daughter, Beverley Anne.

Marriage

EWBANK—EKEBLAD.—On March 28th, at Baltak Church, Tidaholm, Sweden, Roger Ewbank, B.V.SC., M.R.C.V.S., to Inga-Stina Ekeblad, M.A., FIL.KAND., of Baltak. Tidaholm, Sweden.

COMING EVENTS

May

1st (Fri.). Reception and Dance of the Midland Counties Veterinary Association at the Mount Hotel, Tetterhall Wood, Wolverhampton, 9 p.m.

Reception and Dance of the Midland Counties Veterinary Association at the Mount Hotel, Tettenhall Wood, Wolverhampton, 9 p.m.

6th (Wed.). Annual General Meeting of the B.S.A.V.A. Midland Region at the Queen's Hotel, Birmingham, 2.15 p.m.

7th (Thurs.). Annual General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

8th (Fri.). Annual General Meeting of the Midland Counties Veterinary Association at Avoncroft Cattle Breeders Ltd., Avoncroft College, Stoke Prior, Bromsgrove, Worcs., 2.30 p.m.

13th (Wed.). General Meeting of the Lancashire Veterinary Association at Booth's Café, 5, Fishergate, Preston, 2.30 p.m.

Spring Meeting of the Eastern Counties Veterinary Society at the Angel Hotel, Bury St. Edmunds.

15th (Fri.). Dance of the V.V.B.F. Ladies' Guild Eastern Counties Division at the Guildhall, Cambridge, 8 p.m.

Meeting of the B.V.A. Welsh Branch at Aberystwyth.

June

11th (Thurs.). Annual Meeting of the R.A.V.C. Golfing Society at the North Hants Golf Club, Fleet, 10 a.m.

12th (Fri.). Annual Dinner of the R.A.V.C., Officers' Club at Grosvenor House.

August

30th to 5th September. 77th Annual Congress of the British Veterinary Association in Folkestone. (Official opening Monday, August 31st.)

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Aberdeen. Auchterless, Turriff (Apr. 20).
Ayr. Hillhead Farm, Newmilns (Apr. 15).
Essex. Lunendales Farm, Steeple Road, Southminster (Apr. 4).
Lancs. Walker Fold Farm, Lostock, Bolton (Apr. 15).
Staffs. Rooks Nest Farm, Weston (Apr. 14).
Suffolk. Hall Farm, Coney Weston, Bury St. Edmunds (Apr. 16).
Sussex. Shelley Farm, Pease Pottage, Crawley (Apr. 14).
Yorks. Suffield Farm, Suffield, Scarborough (Apr. 14); Westview, Otley Road, Eldwick, Bingley (Apr. 20).

Fowl Pest

Bucks. Harlington Wood End Farm, Tingrith, Bletchley (Apr. 16).
Ches. Oakwood Farm, Withington, Macclesfield (Apr. 16).
Essex. 1, Pinewood Road, Havering-Atte-Bower, Romford (Apr. 14); Maunds Farm, Epping Upland, Epping; Westbury Poultry Farm, Downham, Billericay (Apr. 15).
Herts. Highlands, Berden, Bishops Stortford; 5, Three Stiles Road, Benington, Stevenage; Brookhall Farm, Aston End, Stevenage (Apr. 17).
Lancs. Dingle Hayes Farm, Lathom, Ormskirk (Apr. 16); Laneside, Dickets Lane, Lathom; Warwick Poultry Farm, Lyelake Lane, Lathom; 2, Whitleys Lane, Lathom, Ormskirk (Apr. 19); Fyles Farm, Dickets Lane, Lathom; Roadville, Dickets Lane, Lathom (Apr. 20).
Norfolk. Bale Acres, North Pickenham, Swaffham (Apr. 14).
Oxon. Westhorpe Manor, Greatworth, Banbury (Apr. 19).
Staffs. 85, Commonside; Norton, Canes, Cannock (Apr. 17).
Surrey. Saxons, Godstone Road, Lingfield (Apr. 18); Haylands Farm, Godstone Road, Lingfield (Apr. 20).

Swine Fever

Ches. Warford Hall Farm, Merrimens Lane, Gt. Warford, Macclesfield (Apr. 20).
Devon. Higher Norton Farm, East Allington, Totnes (Apr. 15).
Glamorgan. No. 1 Smallholding, Sully, Barry (Apr. 15).
Glouc. Yew Tree Farm, Somerford Keynes, Cirencester (Apr. 16).
Herts. Springfield Piggeries, Wormley West End, Broxbourne; Watercress Beds Piggeries, Conduit Lane, Hoddesdon (Apr. 20).
Lancs. Whitecross Piggeries, Whitecross Homes, Warrington (Apr. 15).
Leics. The Cottage, Laughton, Market Harborough (Apr. 20).
Norfolk. Ivy Road, Spixworth, Norwich; Manor House Farm, Baconsthorpe, Holt (Apr. 20).
Northants. Conquest House, Farcet, Peterborough (Apr. 20).
Oxon. Glebe Farm, Greatworth, Banbury (Apr. 14).
Salop. Hallon Farm, Worfield, Bridgnorth (Apr. 17).
Somerset. Badger Street Farm, Thurlbeare, Taunton; Perry Street Farm, South Chard, Chard (Apr. 17).
Staffs. Lymes Farm, Seabridge, Newcastle (Apr. 20).
Warwicks. The Bakery, Alderminster, Stratford on Avon (Apr. 20).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Ornithosis (Psittacosis)

Sir,—As there have recently been references in the press to the dangers of transmission of ornithosis from pigeons and other birds to man, it may be of interest to record the specimens from which the virus has been isolated at this laboratory in recent years.

During the period May 1st, 1956, to December 31st, 1958, 411 psittacines (*i.e.* parrot-like birds) and 169 pigeons (*Columba livia*) have been examined. Approximately 80 per cent. of the psittacines were budgerigars (*Melopsittacus undulatus*) and the pigeons were mainly racing pigeons, although fancy varieties and feral pigeons have been included in this total.

Specimens were received from widely separated places in England and Wales. A few were also sent from Scotland, although the majority came from southern England.

Virus isolation was only attempted from a small proportion, *viz.* 7.2 per cent. of the psittacines and 8.2 per cent. of the pigeons, being carried out when the history or *post-mortem* lesions denoted the possibility of active infection. Latent infection may, therefore, have been overlooked.

As shown in the Table below, the virus was isolated from 7 psittacines and 4 pigeons, representing 6 different outbreaks and also in a foreign species of dove and a passerine (*i.e.* perching bird) in contact with psittacines.

Case No.	Species	History	Evidence of association with human infection
1.	2 Black-cheeked lovebirds (*Agapornis nigrigenis*)	Believed recently imported	None
2.	1 Racing pigeon (*Columba livia*)	Outbreak of disease in a loft in Berkshire	None
3.	1 Indian red turtle Dove (*Oenopopelia tranquebarica*)	Believed recently imported	None
4.	2 Fancy pigeons (*C. livia*)	Outbreak in a loft in Lincolnshire	—
5.	1 Fancy pigeon (*C. livia*)	An isolated case at an ornamental bird farm	None
6.	4 Budgerigars (*Melopsittacus undulatus*) 1 Greenfinch (*Chloris chloris*)	Outbreak in an aviary in Hampshire. Origin unknown	None
7.	1 Yellow-fronted amazon parrot (*Chrysotis ochrocephala*)	Recently imported	Associated with pneumonia in a woman.

In the U.S.A. turkeys are one of the chief sources of infection to humans, persons employed in poultry packing stations becoming infected when handling diseased birds. Ornithosis, however, has not been diagnosed in this species at Weybridge or reported in Great Britain.

The disease occurs in ducks in this country, but the incidence of infection is unknown. Asplin (personal communication) has isolated ornithosis virus from diseased ducks from 4 different English flocks. In 3 of these flocks, the primary cause of disease was considered to be *Moraxella anatipestifer* (infectious serositis) and in the other, *Salmonella typhimurium*.

It is obviously not possible to draw definite conclusions from the above findings, but they do suggest that active infections are relatively uncommon in all species, the incidence being highest in pigeons. Andrewes and Mills (1943) reported the recovery of the virus from pigeons in Berkshire and Westminster, and more recently, Hughes (1957) stated that latent infection is not uncommon in pigeons in the vicinity of Liverpool. The investigations by these workers, therefore, together with the limited numbers of cases recorded above, denote that the disease is probably indigenous in pigeons in this country.

In psittacines, active disease appears to be commonest in recently imported birds, and may occur more frequently than the above findings suggest, because undoubtedly illegally imported birds are seldom submitted for examination.

The fact that many psittacine birds are treated with antibiotics such as oxytetracycline, also reduces the chances of isolating the virus from carcases.

Yours faithfully,

I. F. KEYMER.

Ministry of Agriculture Veterinary Laboratory,
New Haw,
Weybridge,
Surrey.

April 20th, 1959.

References

ANDREWES, C. H., & MILLS, K. C. (1943). *Lancet.* **1.** 292-4.
ASPLIN, F. D. (1959). Personal communication.
HUGHES, D. L. (1957). *Vet. Rec.* **69.** 1,061-5.

Use of Suxamethonium (Succinyl Chloride) for Restraint

Sir,—I was very interested in the observations on this subject by Lock and Harthoorn (*Vet. Rec.* **71.** 334). The writers suggest that the information may be "of immediate value to practitioners." I would like to make three points in this connexion, as I feel that it is very undesirable that intra-muscular injection of suxamethonium should be adopted as a normal method of restraint for domestic animals.

(i) Human subjects report that injection of a relaxant into a conscious subject produces "alarm amounting almost to panic" (Evans, 1954; Maingot, 1950). It is reasonable to suppose that an animal,

which cannot understand what is happening, would experience similar alarm in these circumstances. The fact that it does not appear frightened is no real indication that it is unafraid, because once the muscles are paralysed the animal is not able to show the usual signs of fear.

(ii) There are numerous reports (Churchill-Davidson, 1954; Leatherdale *et al.*, 1959; Mayrhofer, 1952) of human subjects experiencing generalised muscle pain during the 48 hours following intravenous injection of suxamethonium. This is particularly noticeable if the patient is allowed to walk about during this period. Pain is also experienced during the muscular twitching which occurs immediately after injection. It is obviously possible that animal patients may experience similar pain, and in human medicine this is now rated as "a serious disadvantage" (Leatherdale *et al.*, 1959) to the use of relaxants.

(iii) When relaxants are used in connexion with surgery, there is always the chance that the patient may be conscious but paralysed, instead of anaesthetised. This has occurred more than once in human medicine (Clark, 1956; Winterbottom, 1950), and Clark has described it as "an altogether new horror. . . . . namely, a conscious pain-appreciating but paralysed patient."

Finally, I would like to add that this drug undoubtedly can produce extreme bradycardia, and kills animals from this cause despite effective artificial respiration. I have found this to be a frequent occurrence in the rabbit, and it has also been reported by Beretervide (1955) in the rabbit and dog, and by Bullough (1959) and Johnstone (1955) in man. The effective dose also seems to be very variable and Wolfers (1953) states that in man no correlation could be found between optimum dose and total body-weight. I would confirm this for the rabbit.

Yours faithfully,
PHYLLIS G. CROFT.

UFAW,
7a, Lamb's Conduit Passage,
London, W.C.1.
April 20th, 1959.

References

BERETERVIDE, K. V. (1956). *Brit. J. Pharmacol.* **10**. 265.
BULLOUGH, J. (1959). *Brit. Med. J.* **i**. 786.
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EVANS, F. T. (1954). "Modern Practice in Anaesthesia." 2nd ed. Butterworth, London.
JOHNSTONE, M. (1955). *Anaesthesia.* **10**. 122.
LEATHERDALE, R. A. L., *et al.* (1959). *Brit. Med. J.* **i**. 904.
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WOLFERS, P. (1953). *Anaesthesia.* **8**. 49.

Salaries in the Veterinary College of Ireland

Sir,—I should like to thank Mr. J. N. Simpson-White for his very interesting and informative letter in support of the demand of the Irish Veterinary Medical Association for adequate remuneration for the work they are accomplishing on behalf of the Irish livestock industry. It is very pleasant and refreshing that one so far away as California should take an interest in the welfare of his colleagues in Ireland and take the trouble to write supporting the Irish veterinarians. On behalf of myself and the rest of my colleagues I wish to tender my sincerest thanks.

Yours faithfully,
ESMONDE W. LITTLE.

4, Lower FitzWilliam Street,
Dublin.
April 19th, 1959.

The R.C.V.S. Council Elections

Sir,—I am very grateful to Mr. E. Wilkinson for his reply to my letter (VETERINARY RECORD, March 28th, page 268), and particularly for explaining the duties of the R.C.V.S. Council. However, there are some details which do require clarification.

In his first paragraph, he states than even an incomplete reply would require several pages of THE RECORD. This is quite true, and in fact I anticipated this requirement in my letter which appeared in THE RECORD dated May 10th, 1958 (page 414), in which I requested that in future years sufficient space be set aside to allow all candidates an opportunity to express their views. Furthermore, I feel that the Editor would have no objection to publishing such letters (or articles) several pages in length, as he did appeal for a continuing supply of contributions in an Editorial earlier this year. May we, therefore, look forward to reading a detailed account of Mr. Wilkinson's views on these questions?

With regard to his second paragraph, my letter was not addressed to the R.C.V.S. Council, or any standing committees thereof, but to the candidates standing for election to that Council. Naturally, I do not expect that the R.C.V.S. Council should take any direct action on such matters as remuneration for members of the profession, but I had hoped to encourage the candidates to state their views on these subjects, so that the voters would be able to ascertain which of them are most suitable to represent the interests of the profession.

I agree with Mr. Wilkinson's contention that the R.C.V.S. Council should lend its moral support to the B.V.A., but I also believe that the former has a clear duty to draw the attention of H. M. Government to the feelings of the profession on certain subjects with which it is intimately concerned. The R.C.V.S. Council, being composed of both elected and nominated members, was intended by the legislators who created it, to function as a connecting link between the profession and the Government. Over the years, however, it has degenerated into a mutual admiration society, in which both politician and veterinary surgeon pay lip service to the virtues of the other. I firmly believe that an honest, out-spoken expression of opinion with regard to the subject matter of this discussion, would do far more to gain the respect and confidence of those officials of H. M.

Government who deal with veterinary affairs, than the complete avoidance of controversial subjects, which has been customary in the past.

I disagree most emphatically with the opinion that questions 1 and 3—relative to foot-and-mouth disease and hog cholera—should be the province of the Technical Development Committee of the B.V.A. The facts of the case are well known to the profession, and to many laymen also. For instance, the importation of foot-and-mouth disease from Argentina has been openly admitted by Lord St. Aldwyn, as Parliamentary Secretary to the Ministry of Agriculture in a speech to the House of Lords on April 20th, 1955. He said: "There is no question that foot-and-mouth disease does occur at intervals in this country through animals being fed with, or having access to, untreated scraps from South American meat." With regard to hog cholera, many intelligent farmers must be asking themselves why it is that the Republic of Ireland can eradicate this disease, while Great Britain, with far greater resources both in finance and manpower, is apparently unable to do so.

No, Sir, the time for technical development is past, and the time for action is here: action in the form of a joint statement by the R.C.V.S./B.V.A. Councils, addressed to H.M. Government, to point out these abuses, and the appropriate remedies. The Minister of Agriculture should be requested to enact legislation empowering him to inaugurate a system of inspection under direct veterinary control, at all establishments where animals are slaughtered for human consumption, to make more effective laws to prevent the entry of diseased meat from overseas, and to control (and eventually eradicate) hog cholera.

While it would be impracticable to enforce all the provisions of the suggested laws immediately, all discussions on improvements in meat inspection and disease control are a waste of time until we have the necessary enabling legislation on the Statute Book. If the presentation of such an authoritative statement did not have the desired effect, then another, more blunt, statement should be prepared, which would indicate clearly that the profession dissociates itself completely from the Government's policy in these matters. I feel sure that public opinion in Great Britain would make the necessary response, if such a statement were issued to the national press.

In his last paragraph, Mr. Wilkinson states that he would like to see, if space allowed, complete reports on the deliberations of the R.C.V.S. I fully agree with this view. May we, therefore, please have a statement of Editorial opinion, as a footnote to this letter, stating whether or not it would be possible for the necessary space to be provided, and also space for the candidates to express their views at length?

I wish to conclude by reminding the candidates that last year Mr. J. F. D. Tutt was good enough to state his views on these questions (*Vet. Rec.* 70. No. 25, page 522), and I can therefore see no reason why all other candidates cannot do the same.

Yours faithfully,
J. N. SIMPSON-WHITE.

9629, San Luis Avenue,
South Gate,
California.
U.S.A.
April 10th, 1959.

[By courtesy of the Royal College, the Minutes of their Council meetings, and of standing committees, are published at regular intervals in THE SUPPLEMENT to THE VETERINARY RECORD. To print anything in the nature of a verbatim account of these proceedings would be exceedingly costly. Space in THE VETERINARY RECORD itself is always at the disposal of those who may wish to address letters to the journal.—*Editor*.]

Vacant Appointments

Sir,—May I repeat the plea for more information when vacant posts are advertised in THE VETERINARY RECORD?

While employers may well wish to arrange salaries at interview, it is surely reasonable that location and type of practice be stated, particularly as those close to areas where we have recently "seen practice" must be avoided.

May I also deprecate the behaviour of those few members who do not reply to enquiries even when stamped-addressed envelopes are sent? I submit that the superfluity of posts does not make all assistants blasé, but we are naturally inclined towards those advertisements which are more explicit.

Yours faithfully,
P. S. JACKSON.

29, Highcroft,
North Hill,
Highgate, N.6.
April 22nd, 1959.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 31st March, 1959		13	—	—	23	—	65
Corresponding period in	1958	15	1	3	22	—	56
	1957	31	—	2	19	—	32
	1956	139	—	—	23	—	31
1st Jan. to 31st Mar., 1959		63	—	1	218	—	288
Corresponding period in	1958	52	2	100	195	—	268
	1957	133	2	15	251	—	213
	1956	822	3	8	171	—	153